

the same time the radula is pulled up and over the apex of the cartilages by the radular muscles in the direction shown by arrow 2. This imposes a second speed on the first. The teeth sliding over the apex are held at right angles to the ribbon and pulled in the arc shown by arrow 3. From the simple law that the speed of a turning wheel is greatest at its circumference, it is seen that the barbs of the teeth at this point are moving at a greater speed than the ribbon itself or the teeth at any other point of the radula. This superimposes a third speed upon the other two, and it is easily seen how the illusion of a rotating wheel is created. This simple mechanical adaption moves the functional part of the radula at a rapid, but undetermined speed, and probably accounts to a large extent for the ability of many gastropods, such as *Thais*, *Murex*, *Eupleura*, *Urosalpinx* and *Buccinum* to bore through the hard shell of other mollusks. It is also possible that the radula is assisted by an acid secretion which softens the shell.

The distinctive structure of the odontophoral apparatus and its similarity in prosobranchiate gastropods leads the writer to believe that this mode of radular movement is typical for most prosobranchs and probably many other gastropods. Observations on *Thais floridana*, *Thais sp.*, and *Melongenella corona* substantiate this hypothesis.

The writer is indebted to Dr. A. S. Pearse for the specimens of *Fasciolaria*.

ZOOLOGY.—*Copepods from the far north collected by Capt. R. A. Bartlett.*¹ CHARLES B. WILSON, Westfield, Massachusetts. (Communicated by MARY J. RATHBUN.)

For several years Capt. R. A. Bartlett has been gathering plankton from the coasts of Labrador, Canada and Greenland, the last cruise taking place during the summer of 1935. The samples thus accumulated have been submitted for examination by the National Museum and the copepods found in them are here listed. The localities from which the plankton was obtained may be conveniently divided into four groups according to geographical location. The first group extended along the entire coast of Labrador from 52 to 60 degrees North Latitude, and included several fishing and whaling grounds. The second group began at the mouth of Hudson Strait, just north of Labrador and extended northwest up the strait into the northern end of Hudson Bay, and thence into Fox Channel, a northern arm of the bay reaching into the Arctic Zone south of Baffin Island. In this

¹ Received March 18, 1936.

group a surface haul taken in the Bay of Gods Mercy on the south shore of Southampton Island, between Hudson Bay and Fox Channel, was remarkable for the number of southern species found in it. Other surface hauls were made while at anchor off the mouth of Fury and Hecla Strait during a furious gale of wind and snow. In these hauls the number of harpactids, usually found only close to the bottom, suggests that the violent agitation of the water during such a gale thoroughly mixes plankton that otherwise might be arranged more or less in layers. The third group embraced Davis Strait, Baffin Bay, the west coast of Greenland, and the straits which separate Greenland from Ellesmere Island from 76 to 78 degrees North Latitude. The fourth group ran along the east coast of Greenland north to the polar ice cap, with one or two stations between Greenland and Spitzbergen.

During the early cruises hauls were made with a dredge at or near the bottom and these seldom contained development stages. During the summer of 1935 a fine-meshed net was used, nearly always at the surface, and all of these hauls contained abundant development stages of copepods, crabs and Euphausiids. An effort was made to take these hauls at regular intervals during the entire twenty-four hours. As a result the plankton contains not only species regularly frequenting the surface during the daytime but also the diurnal migrants which come up from below during the night.

All the localities here recorded are in regions which have been hitherto examined but little for plankton. The lists of copepods here given furnish an interesting supplement to Willey's *Hudson Bay copepod plankton* (Contrib. Canadian Biol. and Fisheries, n.s., vol. 6, no. 25), since they reach farther north into the Arctic Circle. For this reason the lists are well worth publishing though they do not contain any new species.

Again, our knowledge of the geographical distribution of all but a very few species is extremely limited, and new localities are here recorded for nearly every species listed. Some found hitherto only on the coast of Norway or around Franz-Josef Land or Spitzbergen are here revealed far to the west and may well become circumpolar eventually.

Willey has called attention to the presence of Arctic copepods in Passamaquoddy Bay (Amer. Acad. Arts & Sci., vol. 56, no. 5). In these lists we find the exact reverse, the presence of temperate species far within the Arctic Circle. Evidently we cannot as yet fix with complete accuracy the north and south limits of very many species.

The results of this study are presented as a simple faunal list in which the species are arranged alphabetically in each locality. Following this list are notes on the several groups of copepods represented in the collection, Calanoida, Harpacticoida, Cyclopoida, and Notodelphyoida.

STATIONS ALONG THE COAST OF LABRADOR

HAWKES HARBOR. 53° North. Shallow water within the harbor. Dredge tow at the bottom. August 26, 1929. *Calanus finmarchicus*, *Dactylopusia signata*, *D. vulgaris*, *Ectinosoma neglectum*, *Metridia longa*, *Oithona similis*, *Oithonina nana*, *Paracalanus parvus*, *Pseudocalanus elongatus*, *Tisbe furcata*.

HAWKES ISLAND. 53° North. Whaling ground 30 miles off shore. Dredge tow at bottom, net tow at surface. August 31, 1929. *Calanus finmarchicus*, *C. hyperboreus*, *Harpacticus chelifer*, *Oithona similis*, *Oithonina nana*, *Paracalanus parvus*, *Pseudocalanus elongatus*, *Temora longicornis*, *T. stylifera*. Development stages of copepods and crabs at surface.

RED ISLAND. 53° North. Shallow water near shore. Net tow at the surface. August 26, 1929. *Calanus finmarchicus*, *C. hyperboreus*, *Oithona similis*, *Pseudocalanus elongatus*. Crab zoëas and megalops very abundant.

BEN'S COVE, CAPE AILLIK. 55° North. Shallow water within the cove. Surface tows during the day and at night. September 17, 1929, August 16, 17, 1935. *Acartia clausii*, *A. longiremis*, *Calanus finmarchicus*, *C. hyperboreus*, *Farranula carinata*, *F. rostrata*, *Laophonte elongata*, *Oithona similis*, *O. spinirostris*, *Oncaea borealis*, *O. venusta*, *Paracalanus parvus*, *Pseudocalanus elongatus*, *Temora longicornis*, *T. stylifera*. Development stages, especially *Calanus*, *Oithona*, *Temora*.

KAIG-LA-PAIT BAY. 56° North. Shallow water within the bay. Surface tows during the day. September, 1929. *Calanus finmarchicus*, *C. hyperboreus*, *Oithona similis*, *Paracalanus parvus*, *Pseudocalanus elongatus*, *Temora longicornis*, *T. stylifera*.

MUGFORD BAY. 58° North. Shallow water within the bay. Dredge tows at the bottom. September 4, 5, 1929. *Calanus finmarchicus*, *C. hyperboreus*, *Paracalanus parvus*, *Pseudocalanus elongatus*.

MOUTH OF HUDSON STRAIT. 59° North. Deep water off shore. Dredge tow at the bottom. July 25, 1933. *Cyclopina schneideri*, *Dactylopusia vulgaris*, *Ectinosoma neglectum*, *Parathalestris jacksoni*, *Pseudobryadia minor*, *Tisbe furcata*.

CANADIAN STATIONS

BAY OF GODS MERCY, SOUTHAMPTON ISLAND. 64° North. Shallow water in the bay. Both day and night tows while at anchor in the bay. August 5, 1933. *Acartia clausii*, *A. longiremis*, *Bradyopontius magniceps*, *Calanus finmarchicus*, *C. tonsus*, *Clausocalanus arcuicornis*, *Corycaeus anglicus*, *Dactylopusia tisboides*, *D. vulgaris*, *Farranula carinata*, *F. rostrata*, *Harpacticus uniremis*, *Laophonte elongata*, *L. perplexa*, *Oithona similis*, *O. spinirostris*, *Oncaea borealis*, *O. venusta*, *Paracalanus parvus*, *Pseudobryadia minor*, *Pseudocalanus elongatus*, *Pseudocyclops obtusatus*, *Robertsonia tenuis*, *Tisbe gracilis*, *T. furcata*, *Undinula darwini*, *Zaus abbreviatus*, *Z. spinatus*, *Zosime typica*. Development stages.

MOUTH OF FROZEN STRAIT. 66° North. Surface tows in the strait and in Fox Channel. August 14-16, 1933. Strait half frozen across. *Acartia clausii*,

A. longiremis, *Ameira longipes*, *A. tau*, *Calanus finmarchicus*, *Cyclopina schneideri*, *Danielssenia typica*, *Dactylopusia signata*, *Ectinosoma curticorne*, *E. neglectum*, *Laophonte elongata*, *Mesochra pygmaea*, *Oithona similis*, *Oncaea borealis*, *Paracalanus parvus*, *Pseudobradia similis*, *Pseudocalanus elongatus*, *Pseudothalestris pygmaea*, *Robertsonia tenuis*, *Rhynchothalestris helgolandica*, *Temora longicornis*, *Thalestris gibba*, *Tisbe furcata*, *T. minor*, *Zaus abbreviatus*, *Z. spinatus*. Abundant development stages of crabs and copepods.

FOX CHANNEL. 66° to 67° North off Cape Penryhn, Melville Peninsula. Dredge tows at bottom and net tows at surface. August 27-30, 1933. *Acartia clausii*, *Alteutha depressa*, *Arctopontius expansus*, *Arctotrogus orbicularis*, *Ascomyzon intermedium*, *Botryllophilus inaequipes*, *Bradyontius caudatus*, *B. groenlandicus*, *B. magniceps*, *Calanus finmarchicus*, *C. hyperboreus*, *C. tonsus*, *Clausocalanus arcuicornis*, *Cyclopina schneideri*, *Dactylopusia signata*, *Dermatomyzon nigripes*, *Doropygella thorellii*, *Dyspontius striatus*, *Hemicyclops purpureus*, *Laophonte elongata*, *L. horrida*, *Lichomolgus agilis*, *Metridia longa*, *Myzopontius pungens*, *Oithona similis*, *Parartotrogus arcticus*, *Parathalestris jacksoni*, *Pseudobradia minor*, *Pseudocalanus elongatus*, *Pseudomolgus groenlandicus*, *P. leptostylis*, *Robertsonia tenuis*, *Thalestris gibba*, *Tisbe furcata*.

FURY AND HECLA STRAIT. 70° North. Anchored off Esquimaux village. Surface tows, midnight to 8 A.M. in a furious gale of wind and snow. September 7, 1933. *Acartia clausii*, *A. longiremis*, *Amalophora typica*, *Ameira longipes*, *A. tau*, *Amphiascus minutus*, *Bradyontius caudatus*, *Calanus finmarchicus*, *C. hyperboreus*, *C. tonsus*, *Clausocalanus arcuicornis*, *Cletodes tenuipes*, *Cyclopina elegans*, *Dactylopusia signata*, *Ectinosoma curticorne*, *E. neglectum*, *Farranula rostrata*, *Laophonte perplexa*, *L. similis*, *Mesochra pygmaea*, *Microsetella norvegica*, *Oithona similis*, *Oncaea borealis*, *Paracalanus parvus*, *Parathalestris jacksoni*, *Pseudobradia minor*, *P. similis*, *Pseudocalanus elongatus*, *Pseudomolgus groenlandicus*, *Pseudothalestris nobilis*, *P. pygmaea*, *Robertsonia tenuis*, *Thalestris gibba*, *Tisbe finmarchica*, *T. furcata*, *Zaus abbreviatus*, *Z. spinatus*. Development stages of crabs, copepods, and Euphausiids.

DAVIS STRAIT, BAFFIN BAY, AND WEST COAST OF GREENLAND

DAVIS STRAIT. 64° 47' North. Mouth of the strait. Surface tow taken amid floating ice, 3:15 P.M. September 12, 1935. *Acartia clausii*, one male; *Calanus finmarchicus*, copepodid stages, few adults; *Oithona similis*, all adults, the females with ovisacs; *Paracalanus parvus*, two adults.

DAVIS STRAIT. 69° 18' North. Surface tow, 6 A.M., raining. September 4, 1935. *Calanus finmarchicus*, adults and copepodid stages; *Oithona similis*, adults, the females without ovisacs; *Paracalanus parvus*, adults and copepodid stages.

DAVIS STRAIT. 70° North. Surface tow, 10 P.M., in floating ice. September 8, 1935. *Calanus hyperboreus*, adults, the only tow containing them in abundance; *Halithalestris croni*, two adults; *Oithona similis*, adults, a few females with ovisacs; *Paracalanus parvus*, adults; *Pseudocalanus elongatus*, adults.

DISKO ISLAND, GREENLAND COAST. 69° 20' North. Surface tow taken at 10 A.M. July 17, 1935. *Acartia clausii*, *A. longiremis*, *Calanus finmarchicus*, *Halithalestris croni*, *Paracalanus parvus*, *Pseudocalanus elongatus*.

COBOURG ISLAND, OF ENTRANCE TO JONES SOUND, SOUTH OF ELLESMERE LAND. 75° 40' North. Surface tow 2:30 A.M. September 4, 1935. *Calanus*

finmarchicus, *Halithalestris croni*, *Oithona similis*, *Paracalanus parvus*, *Pseudocalanus elongatus*. A few nauplii.

CAPE YORK AND MELVILLE BAY, GREENLAND COAST. 75° North. Surface and vertical hauls during the daytime. July 18–21, 1926; August 4–6, 1932; July 22, 1935. *Calanus finmarchicus*, *C. hyperboreus*, *Ectinosoma curticorne*, *Metridia longa*, *M. lucens*, *Oithona brevicornis*, *Paracalanus parvus*, *Pseudocalanus elongatus*, *Temora longicornis*.

HERBERT ISLAND, INGLEFIELD BAY. 77° North. Surface and vertical hauls during the daytime. July 25, 1926; July 25, 1935. *Augaptilus glacialis*, *Calanus finmarchicus*, *C. hyperboreus*, *Ectinosoma curticorne*, *E. neglectum*, *Metridia longa*, *Oithona similis*, *Parathalestris jacksoni*, *Pseudocalanus elongatus*, *Tegastes falcatus*, *Thalestris gibba*, *Tisbe furcata*, *Zaus aurelii*, *Z. goodsiri*, *Z. spinatus*. Development stages of crabs and copepods.

MURCHISON SOUND AND WHALE SOUND. 77° North. Dredge tow at bottom and net tow at surface. August 17–21, 1926; July 25, 1935. *Calanus finmarchicus*, *Dermatomyzon nigripes*, *Diosaccus tenuicornis*, *Harpacticus chelifera*, *Oithona similis*, *Parathalestris jacksoni*, *Paracalanus parvus*, *Pseudocalanus elongatus*, *Tisbe furcata*.

NORTHUMBERLAND ISLAND. 78° North. Dredge tow at bottom. August 16–17, 1926; July 30, 1935. *Alteutha depressa*, *Amphiascus minutus*, *A. nasutus*, *Bradyopontius magniceps*, *Calanus finmarchicus*, *C. hyperboreus*, *C. tonsus*, *Cyclopina schneideri*, *Dactylopusia signata*, *D. vulgaris*, *Danielsenia fusiformis*, *D. typica*, *Ectinosoma curticorne*, *E. neglectum*, *Halithalestris croni*, *Harpacticus superflexus*, *H. uniremis*, *Metridia longa*, *M. lucens*, *Parathalestris jacksoni*, *Pseudobradia minor*, *Pseudocalanus elongatus*, *Stenhelia aemula*, *Tachidius brevicornis*, *Tegastes falcatus*, *T. nanus*, *Tisbe furcata*, *Zaus aurelii*, *Z. goodsiri*, *Z. spinatus*.

SMITH SOUND, ELLESMERE LAND. 78°10' North. Surface haul at 6:20 P.M. July 31, 1935. *Calanus finmarchicus*, *Oithona similis*, *Paracalanus parvus*, *Pseudocalanus elongatus*. Development stages, especially of *Oithona*.

EASTERN COAST OF GREENLAND

ANGMAGSSALIK, 66° North. Dredge tow at the bottom. August 30, 1930; August 28, 1931. *Calanus finmarchicus*, *Herpyllobius arcticus*, *Microsetella norvegica*, *Paracalanus parvus*, *Pseudocalanus elongatus*, *Tisbe furcata*.

OFF CAPE SIMPSON. 73° North. Surface tow amid pack ice. August 13, 1930. *Calanus finmarchicus*, *C. hyperboreus*, *Pseudocalanus elongatus*. Development stages of copepods, crabs, and Euphausiids.

PENDULUM ISLAND. 74° North. Dredge tow at the bottom. July 20 and 30, 1930. *Augaptilus glacialis*, *Cyclopina schneideri*, *Diosaccus tenuicornis*, *Ectinosoma curticorne*, *E. neglectum*, *Laophonte elongata*, *Mormonilla polaris*, *Parartotrogus arcticus*, *Parathalestris jacksoni*, *Pseudobradia minor*, *Pseudomolgus groenlandicus*, *Scolecithrix brevicornis*, *Temorites brevis*, *Tisbe furcata*, *Undinella oblonga*, *Zaus goodsiri*, *Z. spinatus*.

BETWEEN CAPE BISMARCK AND THE NORTHWEST SIDE OF KOLDEWAY ISLAND. 76° North. Temperature of water 34°F. July 28, 1930. *Calanus finmarchicus*, few adults, but numerous development stages, together with those of crabs and Euphausiids.

NOTES ON THE CALANOIDA

Acartia clausii and *A. longiremis*. These two species are cosmopolitan in distribution and both have been reported from the Hudson Bay plankton by Willey. The males are better differentiated than the females and both sexes were found as far north as the 70th parallel.

Augaptilus glacialis G. O. Sars. This is the only polar representative of the genus and was first obtained during the Norwegian North Polar Expedition. It has since been found much farther south and thus is not exclusively arctic in its distribution. The new localities here given carry it far to the west and suggest that it may be circumpolar.

Calanus finmarchicus (Gunner). Present at almost every locality visited, but nowhere in any abundance except at Inglefield Bay. It was usually found in company with one or both of the other species of the genus, and development stages, probably including all three species, were abundant in the surface tows.

Calanus hyperboreus Krøyer. This large arctic form was also widely distributed but even less abundant than the preceding. The Davis Strait tow from 70° North was the only one containing more than one or two specimens.

Calanus tonsus Brady. This species lacks the serrated inner margins of the basipods of the fifth legs and the genital segment of the female is considerably swollen. This is probably the first record within the arctic circle and the number of specimens is very small.

Metridia longa Lubbock. A hardy arctic species but nowhere found in any abundance, although Nordenskiöld has claimed that it is able to live in immense numbers in water-drenched snow at a temperature below Zero C.

Metridia lucens Boeck. Sars reported this species from within the Arctic Circle on the west coast of Norway, but added that he had never found it in other samples from the Arctic Ocean. The present records from Baffin Bay enable us to regard the species as an arctic form.

Mormonilla polaris G. O. Sars. Found only at Pendulum Island on the east coast of Greenland and obtained by Sars in the Norwegian North Polar Expedition as far north as the 81st parallel of latitude.

Paracalanus parvus (Claus). This is another common species very widely distributed here in the north and sometimes occurring in large numbers. It may be distinctly southern in its range, as reported by Sars, but it is evidently not prevented by the cold from breeding also in the Arctic Ocean.

Pseudocalanus elongatus (Boeck). Very widely distributed throughout the entire area and often the most numerous single species obtained. It was somewhat more abundant in shallower water than in deeper water, and evidently descends to the very bottom. The new localities here added make it circumpolar in its distribution.

Pseudocyclops obtusatus Brady. In spite of its generic name this is a peculiar small calanid, readily recognized by the structure of the fifth legs in both sexes. It was obtained by Sars on the Norway coast nearly as far north as the single female found in the plankton from the Bay of Gods Mercy.

Sclecithrix brevicornis G. O. Sars. The specimens described by Sars were found north of the 81st parallel of Latitude and east of Franz-Josef Land. Capt. Bartlett's specimens came from Pendulum Island on the east coast of Greenland and a little farther south.

Temora longicornis G. O. Sars. Cleve has reported this species from the Atlantic Ocean as far north as the 72nd parallel of Latitude. With one exception the specimens of the present list all came from the Labrador coast considerably farther south.

Temora stylifera (Dana). This is primarily a tropical species, but has been reported by Giesbrecht as far north in the Atlantic Ocean as the 60th

parallel of latitude. The present specimens came from the Labrador coast considerably farther south than that parallel.

Temorites brevis G. O. Sars. This is a very small species originally obtained during the Norwegian North Polar Expedition considerably to the east of the present localities. Here it was found only at Pendulum Island on the east coast of Greenland.

Undinella oblonga G. O. Sars. This small copepod looks very similar to a cyclopoid, but an examination of its appendages shows it to be a true Calanid. It has not thus far been found anywhere except in the Arctic Ocean.

Undinula darwini (Lubbock). This calanid is usually found much farther to the south, but two males were present in the plankton taken in the Bay of Gods Mercy on Southampton Island. The structure of the fifth legs of these males is so peculiar as to leave no doubt of their identity.

NOTES ON THE HARPACTICOIDA

As already stated many of the present specimens were taken in dredge hauls at or near the bottom. Since there are more Harpactids at that depth than other kinds of copepods it would be expected that the species of this suborder would outnumber those of any of the other groups. The following lists shows that this really happened, the number of Harpactids equalling that of all the other suborders combined.

Alteutha depressa Baird. This is not a true arctic species, but it is a hardy copepod and has been found by Sars about as far north on the western coast of Norway.

Ameira longipes Boeck. This copepod has been reported by Sars from the polar islands north of "Elsemer" (Ellesmere) Land, taken in the second "Fram" expedition. Thus far the species has been confined to polar seas. The present specimens came from the mouth of Frozen Strait.

Amphiascus minutus (Claus). Found only near Northumberland Island in Smith Sound in company with the following species. It has been reported by T. Scott from Franz-Josef Land at about the same latitude farther east.

Amphiascus nasutus (Boeck). Twice the size of the preceding species, in company with which it was found, and so readily separated by size alone. It is distinctly arctic in distribution but comes down into the temperate zone along the west coast of Norway.

Cletodes tenuipes T. Scott. This harpactid has been reported from Franz-Josef Land by Sars, but has not before been captured in American waters. In the present plankton it was confined to the single peculiar tow taken near the mouth of Fury and Hecla Strait.

Dactylopusia signata Willey. Found on the Labrador coast, in Fox Channel, and also at Northumberland Island, where it was in company with the following species. Willey's original specimens came from farther west and were captured in a net let down through the ice.

Dactylopusia vulgaris G. O. Sars. Found in company with the preceding and about the same size but easily distinguishable by the structure of the fifth legs in the female. This is one of the commonest harpactids and was found by Sars along the entire Norwegian coast, even those portions which lie in the Arctic Ocean.

Danielssenia fusiformis (Brady). Confined to the single locality of

Northumberland Island in shallow water. This is a temperate rather than an arctic species and is here reported from Greenland for the first time.

Danielssenia typica Boeck. Found in company with the preceding and also at the mouth of Frozen Strait, these being the first American localities. It has been reported from Nova Zembla and Franz-Josef Land farther east.

Diosaccus tenuicornis (Claus). A few specimens were taken between Greenland and Ellesmere Land. Although it is not an arctic species it has been found nearly as far north on the Norwegian coast.

Ectinosoma curticorne Boeck. Found in several of the present lists and has been reported from Spitzbergen by T. Scott. Its small size and very short first antennae, each with a dusky patch inside the basal segment, will serve as distinctive features.

Ectinosoma neglectum G. O. Sars. Found on the Labrador coast and at several of the Canadian localities both in Capt. Bartlett's plankton and in that obtained by the Canadian Arctic Expedition. It was also reported by Sars from the north coast of Norway and is probably circumpolar.

Halithalestris croni (Krøyer). This is one of the largest harpactids and may be recognized by its size and by the long divergent caudal rami. It is a pelagic species but drifts in with the currents into various bays and straits and has been reported before from the west Greenland coast by Walker and Miers.

Harpacticus chelifer (Müller). Found only on the Labrador coast and in Murchison Sound, but has been reported by Sars from Egedesminde on the west coast of Greenland and by T. Scott from Franz-Josef Land.

Harpacticus superflexus Willey. Northumberland Island in the strait between Greenland and Ellesmere Land furnished the only specimens of this species. It was originally obtained by the Canadian Arctic Expedition considerably farther west and nearly as far north.

Harpacticus uniremis Krøyer. Found in company with the preceding species and has been reported from Behring Sea by Poppe, from Spitzbergen by T. Scott and from the whole Norwegian coast by Sars. It may thus be considered as an arctic form, coming down at times into the temperate zone.

Laophonte elongata Boeck. Found in three of the four regions here listed and reported by T. Scott from Franz-Josef Land. It may be distinguished by the structure of the fifth legs and by the long parallel caudal rami.

Laophonte horrida Norman. Found only in Fox Channel in company with the preceding species but has been reported from both the eastern and western coasts of Greenland. When obtained the specimens are usually so densely covered with mud that the body spines are invisible. If the mud is washed away the spines will serve to identify the species.

Laophonte perplexa T. Scott. Originally obtained by Scott from Franz-Josef Land the species was subsequently reported by Sars from Norway. Its presence in the plankton from the Bay of Gods Mercy is the first record from American waters.

Mesochra pygmaea (Claus). This minute harpactid is a dwarf form whose body segments have the appearance of being telescoped together. It has been reported from Franz-Josef Land and from the polar islands north of Grinnel Land.

Microsetella norvegica Boeck. Found at only two of the present stations but given a wide distribution in the Arctic Ocean by Cleve and Sars. It is a very small species but often found in large numbers.

Parathalestris jacksoni (T. Scott). Found in the last three regions but not along the Labrador coast and reported by Sars from the northern coast of Norway and by T. Scott from Franz-Josef Land.

Pseudobradya minor (T. & A. Scott). Like the preceding species this is well distributed everywhere except on the Labrador coast, but only one or two specimens in any locality. It was obtained by the Canadian Arctic Expedition from Bernard Harbor, Northwest Territories far to the west.

Pseudobradya similis (T. Scott). Found only in the plankton from the mouth of Frozen Strait, almost up to the Arctic Circle, and originally obtained by Scott from Franz-Josef Land.

Pseudothalestris pygmaea (T. Scott). This is another of the dwarf species whose body segments appear to be telescoped together, giving it a peculiar stunted appearance. It was found only at the mouth of Frozen Strait.

Rhynchothalestris helgolandica (Claus). This was originally obtained by Claus from Helgoland, but has been reported from Greenland by Stephensen and from various localities in the Arctic Ocean. It was here confined to the plankton from the mouth of Frozen Strait.

Robertsonia tenuis Brady. Only a few specimens of this species were found in the second group of localities, but it has been obtained by Scott from Spitzbergen and Franz-Josef Land, and from Greenland by Wesenberg-Lund.

Stenhelia aemula (T. Scott). A few specimens were found at Northumberland Island and this is the first record of the species in polar regions.

Tachidius brevicornis Lilljeborg. Another species captured only at Northumberland Island in the bottom dredge. It is a widely distributed species chiefly confined to temperate localities but taken by the Canadian Arctic Expedition well within the Arctic Circle.

Tegastes falcatus Norman. Also taken in the bottom dredge at Northumberland Island, it has been reported by T. Scott from Nova Zembla and Franz-Josef Land. It has also been found around the British Isles and near Ceylon and hence is not confined to arctic seas.

Tegastes nanus G. O. Sars. This was found in company with the preceding species and is even smaller in size. It has previously been reported only from the Norwegian coast by Sars, at about 63° North Latitude.

Thalestris gibba (Krøyer). Two specimens were obtained from Fox Channel and three from Inglefield Bay; it has also been recorded by Scott from Franz-Josef Land and by Sars from the north coast of Finland.

Tisbe finmarchica (G. O. Sars). Sars reported this as a true arctic species from the northern coast of Finmark and the polar islands north of Grinnell Land. In the present lists the species is confined to two specimens from the peculiar plankton taken at Fury and Hecla Strait.

Tisbe gracilis (T. Scott). This species is confined to the plankton from the Bay of Gods Mercy. It was originally found on the Scottish coast, but was reported by Sars from the Finmark coast and the west coast of Norway as far north as the present locality.

Tisbe minor (T. Scott). Found in the present plankton only at the mouth of Frozen Strait, but reported by Scott from Franz-Josef Land, and by Sars from the west coast of Norway as far north as Frozen Strait.

Tisbe furcata (Baird). Found at a majority of the localities here listed, often in considerable numbers, and recorded as widely distributed throughout the Arctic Ocean.

Zaus abbreviatus G. O. Sars. This is the smallest species of the genus,

and has been found on the west coast of Norway and north of Grinnell Land. Its appearance at two of the present localities is new to American waters.

Zaus aurelii Poppe. Found at Northumberland Island, and recorded by Scott from the northern coast of Finmark. This is one of the larger species and has a very small rostrum and a very narrow urosome.

Zaus goodsiri Brady. Found on both the east and west coasts of Greenland and recorded from Spitzbergen by Scott and from the polar islands north of Grinnell Land by Sars. It is half as large again as the preceding form and shows a huge angular rostrum.

Zaus spinatus Goodsir. Found in many of the present localities except those along the Labrador coast, and reported to be widely distributed in the arctic zone. This is the smallest of the four species and only two-fifths the size of *goodsiri*, with a slightly prominent semicircular rostrum.

Zosime typica Boeck. This species was confined to the plankton from the Bay of Gods Mercy, its first appearance in American waters, but it has been recorded by Scott from Franz-Josef Land and Nova Zembla.

NOTES ON THE CYCLOPOIDA

Some of the cyclopids here listed probably live semiparasitically upon or within the bodies of other marine animals. But having been captured while swimming freely there is nothing to connect them with any host. Some of them, however, appeared in the plankton taken by the Danish Ingolf Expedition, and in the account of that expedition were assigned by Hansen to definite hosts.

Arctopontius expansus G. O. Sars. Occurring in these lists only in Fox Channel, it was obtained by the Ingolf Expedition in Davis Strait, and is probably more or less well distributed in this region. Neither in the Ingolf material nor in that examined by Sars was any host discovered.

Artotrogus orbicularis Boeck. Found only in Fox channel; Boeck's original specimen came from the south coast of Norway, where other specimens were later found by M. Sars. It has also been reported from the Kara Sea by Hansen, and in all three instances was taken from nudibranch mollusks.

Ascomyzon intermedium Hansen. Found only in Fox Channel, but was also obtained by the Ingolf Expedition from Davis Strait, where it was dredged at a depth of 582 fathoms. All the specimens thus far obtained have been females with no hint of their host.

Bradypontius caudatus G. O. Sars. Associated with the preceding species in Fox Channel, but not obtained by the Ingolf Expedition. Sars stated that it was the largest siphonostomous cyclopoid (2.90 mm. long) with which he was acquainted and nothing is known of its host.

Bradypontius groenlandicus Hansen. A second species of the same genus from Fox Channel and reported by the Ingolf Expedition from Davis Strait. Hansen's material included both sexes but the present specimens were all females, with nothing to suggest their host.

Bradypontius magniceps (Brady). A third species of the genus from Fox Channel, not obtained by the Ingolf Expedition but reported by Sars from western Finmark a little farther north, without data as to the host.

Cyclopina schneideri T. Scott. Found at several localities in Fox Channel and on both coasts of Greenland and recorded by Scott from Spitz-

bergen and Franz-Josef Land and from the Norwegian coast by Sars. This is very likely a free swimming form and not semiparasitic.

Corycaeus anglicus Lubbock. Sars has designated this as a pronouncedly pelagic species which is occasionally swept into the Norwegian fjords and similar locations by strong currents. It has not been reported previously from any American locality.

Dermatomyzon nigripes (Brady). Found in Fox Channel and Murchison Sound and reported by Scott from Spitzbergen and Franz-Josef Land. It is not, however, exclusively arctic but is also found in the temperate zone.

Dyspontius striatus Thorell. Found only in Fox Channel but reported by Sars from the Finmark coast considerably farther north. It is also widely distributed in the temperate zone and is even found in the Bay of Naples. Sars regarded this species as in all probability free swimming.

Farranula carinata (Giesbrecht), and **F. rostrata** (Claus). These minute cyclopids seem out of place in plankton from so far north, but their identification is easy and certain. They were present on the coast of Labrador, in the Bay of Gods Mercy and at Fury and Hecla Strait.

Hemicyclops purpureus Boeck. Found in Fox Channel which is a little farther north than previous records of the species. When alive the oviducts and ovisacs are bright red in color and this is not wholly lost in formalin.

Lichomolgus agilis (Leydig). Found in Fox Channel and reported by Scott from the British Isles and by Sars from the Norway coast. Sars was able to determine that the Norway specimens were parasitic upon nudibranch mollusks.

Myzopontius pungens Giesbrecht. Found only in Fox Channel and reported by Scott from Franz-Josef Land and by Sars from the Norway coast although Giesbrecht's types came from the Bay of Naples.

Oithona similis Claus. Found in most of the localities here listed and very widely distributed in all oceans and zones. To judge from the larvae found in the surface tows it breeds extensively in these northern latitudes.

Oithona spinirostris Claus. Common along the Norwegian coast as far north as the present localities, but has not before been reported from any American plankton. Usually found in company with the preceding species.

Oithonina nana Giesbrecht. Found in company with the preceding along the southern portion of the Labrador coast, and this record is apparently a little farther north than any previous American report.

Oncaea borealis G. O. Sars. Found at the Bay of Gods Mercy and in Fox Channel and reported from the Norway coast and the Polar Sea. It is somewhat more strictly an arctic form and not found much farther south.

Oncaea venusta Philippi. This is another southern form found on the coast of Labrador and in the Bay of Gods Mercy. It is very widely distributed in temperate and tropical localities but this is the farthest north that it has been recorded.

Parartotrogus arcticus T. Scott. Found in Fox Channel and at Pendulum Island and has been reported from Spitzbergen and Nova Zembla by Scott, and from the east coast of Greenland by Hansen.

Pseudomolgus groenlandicus Hansen. Found only at Pendulum Island on the east coast of Greenland but reported by Hansen to occur also on the west coast along the shore of Baffin Bay.

NOTES ON THE NOTODELPHYOIDA

Botryllophilus inaequipes Hansen. A single female was taken in Fox Channel while Hansen's types were obtained from Davis Strait. It will probably be found in other localities upon further investigation.

Doropygelia thorellii Aurivillius. Found only in Fox Channel but taken by the Ingolf Expedition from Davis Strait and by Schmidt from southeast of Iceland. It is found in the branchial cavity of ascidians.

Herpyllobius arcticus Steenstrup & Lütken. A single female was found on the annelid, *Harmothoë imbricata*, on the east coast of Greenland. The Ingolf Expedition reported the species from Davis Strait and the west coast, all the annelid hosts belonging to the genus *Harmothoë*.

ICHTHYOLOGY.—A new polynemid fish collected in the Sadong River, Sarawak, by Dr. William T. Hornaday, with notes on the genera of Polynemidae.¹ GEORGE S. MYERS, United States National Museum. (Communicated by A. WETMORE.)

Fifty-nine years ago, William T. Hornaday, now the honored director-emeritus of the New York Zoological Park, travelled in India, the Malay Peninsula, and Borneo to collect natural history specimens for Ward's Natural Science Establishment of Rochester. His book dealing with that trip, *Two Years in the Jungle* (New York, 1885), is now one of the classics of zoological exploration in Asia. The fishes collected by Dr. Hornaday became the property of the United States National Museum, in which institution he remained for several years as chief taxidermist. Some of the fishes were identified by Dr. Tarleton Bean and the rest have recently been determined by the present writer. One species, a remarkable *Polynemus*, appears to be unnamed more than half a century after its collection.

***Polynemus hornadayi*, n. sp.**

Holotype.—U.S.N.M. 100632, a specimen 195 mm standard length and 260 mm including caudal fin, obtained by W. T. Hornaday on October 2, 1877, while fishing with poison, in the Ensengi River, a large creek emptying into the Sadong River from the west about six miles below Simujan, southwestern Sarawak, Borneo. Dr. Hornaday described the Ensengi as a stream 40 feet wide and 8 to 10 feet deep, with murky water and swift current. The holotype is the identical specimen illustrated on the plate facing page 386 of *Two Years in the Jungle*, from a pen and ink drawing of the late Dr. Frederic A. Lucas. The figure is reproduced here.

Paratypes.—U.S.N.M. 35719, ten smaller specimens, obtained at the same place and on the same date. One of these is now in the British Museum.

Diagnosis.—A species of *Polynemus* allied to *P. hilleri* Fowler, *P. paradiseus* Linnaeus, and *P. dubius* Bleeker in the presence of but seven dorsal spines, but differing in the very tiny scales, 94 to 97 in the lateral line to caudal base and 31 to 35 in transverse series from origin of first dorsal to pelvic origin.

Description.—Dorsal VII–I, 15½. Anal II—11½. Pectorals 16 to 18, with 7 filaments. Pelvics I–5. Lateral line scales with pores, from upper end of gill opening to end of hypural fan, 94 to 97. Transverse scales from origin of first dorsal to pelvic base 8 to 9/1/21 to 25. Gill rakers fairly long, 12 on upper and 15 on lower limb of first arch.

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